

$\frac{1}{100}$ th of an inch the focal length of the convex and concave surfaces under operation.

Although I have heretofore described the cellular casting as having a flat face, it will be obvious that if made into a concave corresponding with the intended focal length of the reflector that much thinner sheets of glass than those before named may be employed by first bending them to the required curve and fitting them by grinding to the concave iron surface, so that a glass reflector can on this principle be made just as large as a plate-glass manufacturer can produce an ordinary thin plate.

A description of the novel arrangements which I employ for grinding and polishing the spherical concave reflector, and its conversion into a paraboloid of revolution would carry me far beyond the already too lengthy remarks I have made, and which had for their primary object simply to show that we may still have good reason to hope that silver-on-glass reflectors of large diameters are within our reach.

HENRY BESSEMER

Denmark Hill, January 21

A Telephone Without Magnetism

FOR some time past I have been experimenting with the view of transmitting articulate sounds through wires without the aid of electricity or magnetism.

I have now been quite successful, my experiments proving that the sounds of the human voice can be carried by vibrations through considerable lengths of wire.

Last night conversation was carried on with ease between four individuals, situated in different rooms. Piano music, singing, laughing, and breathing, were all clearly transmitted to the ear.

The whole distance would be about fifty yards.

The communication was effected by means of a mouth-piece with a vibrating disc in connection with the wire.

Glasingow

W. J. MILLAR

Change of Habits in Toads

WHILE prosecuting my field-work as Palæontologist of the United States Geological Survey of the Territories, under the direction of Prof. F. V. Hayden, in Colorado, during last season, I had the opportunity to make some very interesting observations in relation to a change of habits in the common toad (*Bufo americana*). The district referred to is that portion of the great plains which lies immediately adjacent to the eastern base of the Rocky Mountains, and which is traversed by the South Platte River and its tributaries there.

The valleys of these streams are broad and shallow, and the streams heading in the immediately adjacent mountains have an abundant flow of water; so that large tracts of land in all those valleys have been brought under cultivation by irrigation. Irrigation is necessary in all that region, for it lies within that portion of the United States domain upon which the annual rainfall is insufficient for the purposes of agriculture.

With the irrigation of the land came increased and perennial vegetation with that came increased insect-life, and with that an increase of birds and toads. The irrigating ditches are everywhere numerous, and during the season of growing crops they are frequently visited by men to regulate the flow of water to the land.

This and other circumstances disturb the toads that frequent the shades of the herbage which grows upon the borders of the water. It is no uncommon thing for toads as well as frogs, to jump into the water when disturbed, but the habit of the former is to make a shallow dive, rise immediately to the surface, and swim upon it by a sweeping curve to the shore again, not resting until the brink is gained, upon which they tarry a while before coming upon the land.

Frogs, on the contrary, when disturbed, make a strong dive directly to the bottom, upon which they lie prone, with the legs flexed against the body, and into the mud of which they settle themselves a little. Here they remain and exhaust the patience of one who may attempt to wait for them to rise. Now the toads in this irrigated region have adopted precisely these common habits of the frogs when disturbed upon the borders of the ditches, as I repeatedly witnessed. I regard this as the resumption of an instinctive trait that has been potentially transmitted from a former race of Anouans that were less differentiated than frogs and toads are now from each other; and that the lately introduced change of physical conditions in the region has caused the toads to resume habits which the frogs have never abandoned.

Washington, D.C., January 6

C. A. WHITE

Talking Photographs

THE article from the *Scientific American* on the phonograph which is quoted in NATURE, vol. xvii. p. 190, concludes as follows:—"It is already possible, by ingenious optical contrivances, to throw stereoscopic photographs of people on screens in full view of an audience. Add the talking phonograph to counterfeit their voices and it would be difficult to carry the illusion of real presence much further."

Ingenious as this suggested combination is, I believe I am in a position to cap it. By combining the phonograph with the kinesiograph I will undertake not only to produce a talking picture of Mr. Gladstone which, with motionless lips and unchanged expression shall positively recite his latest anti-Turkish speech in his own voice and tone. Not only this, but the life-size photograph itself shall move and gesticulate precisely as he did when making the speech, the words and gestures corresponding as in real life. Surely this is an advance upon the conception of the *Scientific American*!

The mode in which I effect this is described in the accompanying provisional specification, which may be briefly summed up thus: Instantaneous photographs of bodies or groups of bodies in motion are taken at equal short intervals—say quarter or half seconds—the exposure of the plate occupying not more than an eighth of a second. After fixing, the prints from these plates are taken one below another on a long strip or ribbon of paper. The strip is wound from one cylinder to another so as to cause the several photographs to pass before the eye successively at the same intervals of time as those at which they were taken.

Each picture as it passes the eye is instantaneously lighted up by an electric spark. Thus the picture is made to appear stationary while the people or things in it appear to move as in nature. I need not enter more into detail beyond saying that if the intervals between the presentation of the successive pictures are found to be too short the gaps can be filled up by duplicates or triplicates of each succeeding print. This will not perceptibly alter the general effect.

I think it will be admitted that by this means a drama acted by daylight or magnesium light may be recorded and reacted on the screen or sheet of a magic lantern, and with the assistance of the phonograph the dialogues may be repeated in the very voices of the actors.

When this is actually accomplished the photography of colours will alone be wanting to render the representation absolutely complete, and for this we shall not, I trust, have long to wait.

WORDSWORTH DONISTHORPE

Prince's Park, Liverpool, January 12

Sun-spots and Terrestrial Magnetism

I BEG to direct Prof. Piazzì Smyth's attention to an article in the *Annuaire du Bureau des Longitudes* for 1878 by M. Faye, entitled "La Météorologie Cosmique," in which this distinguished astronomer and meteorologist says:—"La période des taches, portée à 11^{ans} par M. Wolf n'étant pas égale à celle des variations magnétiques (10^{ans} 45), ces deux phénomènes n'ont aucun rapport entre eux." It thus appears rather premature to suppose that the sun-spot cycle and the terrestrial magnetic diurnal oscillation cycle are intimately connected.

A. W. DOWNING

Greenwich, January 21

Great Waterfalls

IN reply to Mr. Guillemand's inquiry in NATURE (vol. xvii. p. 221) he will find some account of the Káviri or Cauvery Falls in the "Mysore Gazetteer," recently compiled under orders of the Indian Government, vol. ii. pp. 271-273 (Bangalore, 1876). A copy is doubtless to be seen at the India Office Library.

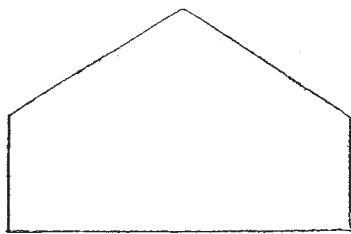
Edinburgh, January 21

W. W. HUNTER

Mechanical Analysis of the Trevelyan Rocker

ALMOST every physical cabinet possesses one of Trevelyan's rockers, and yet it is rare to find one which always works well and gives complete satisfaction. Some two years ago having experienced this difficulty in New York, where I was then Professor of Physics, I requested Mr. Robert Spice, F.C.S., of 230, Bridge Street, Brooklyn, U.S., a very skilful constructor of acoustic instruments, and a thorough physicist, to make for me several of these rockers and ascertain, if possible, the conditions

of success. After many experiments with rockers of different sizes and angles, Mr. Spice obtained a formula by which a perfectly satisfactory rocker can be constructed, as several trials since then, both in America and Europe, have convinced me. Be-



lieving that there are many other professors who feel interested in this matter I communicate to the readers of NATURE, at Mr. Spice's request, his analysis of the rocker.

Let $ABCD$ be the principal section of the rocker. Draw an indefinite base-line through the points C and D . From the point

B let fall the perpendicular BE , and from F the perpendicular FD .

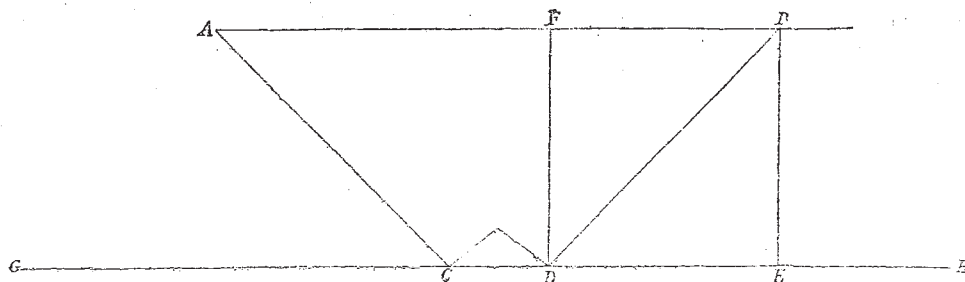
When the lead support raises (by expansion) the point D the point C becomes the fulcrum, and the line DE represents the complimentary arm of an imaginary lever CDE of the third order. In proportion as the distance CD is very small in comparison with the distance DE , in a like proportion will greater force be required to raise the rocker, and *vice versa*.

By experiment on a right-angled prismatic rocker (*i.e.* if the lines AC and BD be produced the angle at their intersection would be a right-angle) it was found that the most certain and pleasing effect was obtained when the distance CD was to the distance DE as $2:5$.

In the case of a right-angled rocker as above, of course the distance $DE =$ the distance DF .

By making the rocker-angle less than a right-angle, the distance DF would exceed the distance DE . This, it is believed, would be an advantage, as the leverage would remain constant and the additional weight would have the effect of raising the note.

The length of the rocker should be equal to twice AB . The



length of the handle should be four times AB . Finally, in practice, the angles C and D are slightly flattened, by filing, to prevent adhesion to the lead by sinkage, also to gain a larger heating surface.

The lead should have the form shown in the section below, and should weigh from three to four pounds.

SAMUEL H. FRISBEE

11, rue des Récollets, Louvain

No Butterflies in Iceland

A FEW months ago, at a meeting of the Linnæan Society, Mr. McLachlan, when speaking of the various species of butterflies brought to England from the far north by the last English Arctic expedition, mentioned incidentally that there were no butterflies in Iceland.

On looking up some old books on the subject, in which I had the most able assistance of Mr. Erickr Magnussen, of Cambridge, we found at folio 602 of a book entitled, Olafsson (Eggert) Reise giennem, Island. Sorö, 1772.

LEPIDOPTERA.

- L. phalæna.*
- „ *maxima.*
- „ *fluctuata.*
- „ *gometra.*
- „ *tota aurea.*

Again, in a work by R. Mohr, 1786, folios 90-91, under the head "Lepidoptera," we have—

- L. phalæna.*
- „ *graminis.*
- „ *betularia.*
- „ *olivacea.*
- „ *lucerna.*
- „ *vaccinii.*
- „ *fluctuata.*
- „ *pratella*, &c., &c.,

all of which are named as butterflies of Iceland.

Mr. McLachlan is a very high authority, and not at all likely to assert as a fact that there are now "no butterflies in Iceland," unless it were true.

The only possible way in which these perfectly opposite authorities can be reconciled (unless we throw aside those of a hundred years ago as worthless), is to suppose that in the interval the butterflies and their larvæ have been destroyed—not an impossible circumstance in Iceland, which has been almost, if not

wholly, covered with poisonous volcanic ashes from time to time.

Kensington, January 18

JOHN RAE

The Great Pyramid

I HAVE been reading in Mr. Piazza Smyth's book on this subject ("Our Inheritance," &c.). From the measurements made or cited by the author it appears tolerably clear that if the vertical height of the pyramid, as originally built, be taken as 1, the total length of the four base lines will be twice $3'14159$, &c., the number which expresses the circumference of a circle whose diameter is 1. At first sight this statement seems startling, but I think it may readily be acceded to, and that neither Mr. P. Smyth nor anyone need believe that by inspiration or otherwise, the architect knew the above relation of diameter to circumference, or was a circle-squarer in any special sense. I conceive the architect to have done something like the following:—Deciding first upon the vertical height of his intended pyramid, he took a cord, equal in length to that vertical height, and with it as a radius described a circle on level ground. Along the circumference of this circle he laid another cord, the ends of which met and were fastened together. The circle being thus formed, he drove four pegs, at equal distances inside the cord, so as to stretch it out into a square. The square thus formed gave the lines for the base of the pyramid; and it is obvious that thus the ratio of diameter to circumference would necessarily be built into the pyramid, however ignorant the architect might be. Working drawings (actual size) of surfaces, angles, chambers, passages, and other things would easily be laid out on the ground. The dimensions of the so-called King's chamber, and of a coffer or stone chest therein, which appear to involve the above ratio of 1 to $3'14159$, &c., were, I think, arrived at by a somewhat similar process of construction.

Now as to the religious aspect of the case and an easy bit of "development." A cone is a well-known ancient religious symbol (of the kind denounced by Mr. P. Smyth as unclean),